

What is claimed is:

1. A system comprising:

an induction machine with a stator and a rotor, said stator having a plurality of phase windings;

5 an inverter having a plurality of solid-state switches with appropriate controls and having the same number of phases as said induction machine, said inverter being connected to selectively energize said windings; and

a programmable microprocessor operatively connected to  
10 said inverter and including a program for controlling said inverter that includes operating said induction machine using pole phase modulation.

2. A system according to claim 1, wherein said  
15 program operates to control the induction machine as a generator.

3. A system according to claim 1, wherein said  
program operates to switch control of said induction  
20 machine between a motoring operation mode and a generating operation mode, each of said operation modes operates said induction machine with a desired number of poles.

4. A system according to claim 2, wherein said  
25 program operates to switch control of said induction

machine between a motoring operation mode and a generating operation mode, each of said operation modes operates said induction machine with a desired number of poles.

5            5. A system according to claim 1, wherein said stator is a toroidally wound stator.

6. A system according to claim 1, wherein said rotor is a squirrel cage rotor.

10           7. A system according to claim 1, wherein said stator is a toroidally wound stator and said rotor is a squirrel cage rotor.

15           8. A system according to claim 1, wherein said programmable microprocessor is a digital signal processor.

9. A system according to claim 1, wherein said microprocessor further includes steps for controlling said inverter by vector control.

20           10. A system according to claim 1, further comprising a position sensor operatively connected to said induction machine for providing a position indication that is

indicative of a relative position of said rotor and said stator.

11. A system comprising:

5        an induction machine with a stator and a rotor, said  
stator having a plurality of phase windings;

a position sensor operatively connected to said induction machine for providing a position indication that is indicative of a relative position of said rotor and said stator;

an inverter having a plurality of solid-state switches with appropriate controls and having the same number of phases as said toroidal induction machine, said inverter being connected to selectively energize said windings; and

15           a programmable microprocessor operatively connected  
and including a program to implement vector control of said  
induction machine, said microprocessor also controlling  
said inverter so that said induction machine operates with  
pole phase modulation.

20

12. A system according to claim 11, wherein said program operates to switch control of said induction machine between a motoring operation mode and a generating operation mode, each of said operation modes operates said  
25 induction machine with a desired number of poles.

13. A system according to claim 11, wherein said stator is a toroidally wound stator and said rotor is a squirrel cage rotor.

5

14. An automotive propulsion system including a system comprising:

an induction machine with a toroidally wound stator and a squirrel cage rotor, said toroidally wound stator  
10 having a plurality of phase windings;  
a position sensor operatively connected to said induction machine for providing a position indication that is indicative of a relative position of said rotor and said stator;  
15 an inverter having a plurality of solid-state switches and a control system, said inverter having the same number of phases as said toroidal induction machine, said inverter being connected to selectively energize said windings; and  
a programmable digital signal processor operatively  
20 connected to said induction machine, said programmable digital signal processor including a program to implement vector control of said induction machine, said programmable digital signal processor controlling said inverter so that said induction machine operates with a predetermined number  
25 of poles using pole phase modulation.